respectfully request reconsideration of claims 1, 4, 8-10, 12-23 and 25, including independent claims 1, 10, 16, and 23.

Independent claim 1 requires determining a lowest value of a display dynamic range and setting a transmit power as a function of a noise level and the lowest value of the display dynamic range. Likewise, independent claim 10 requires a processor operative to set the transmit power level as a function of a noise level and a lowest value of a display dynamic range.

Mucci et al. do not disclose the above limitations. Mucci et al. disclose optimizing the data display of noise and signal information (col. 3, lines 45-60). Noise information is separated from signal information by signal enhancement (col. 8, lines 17-38). Values classified as signal are increased, and values classified as noise are decreased (col. 8, lines 52-59). A grey scale map is then used to map the resulting values within the dynamic range (col. 9, lines 3-9). Running averages or means of the signal amplitudes and noise amplitudes are separately maintained (col. 7, line 65-col. 8, line 9). Transmit power is "set on the basis of signal power relative to the noise power (S/N) as determined from the estimates of signal and noise mean" (col. 9, line 58-col. 10, line 13). To set the transmit power, Mucci et al. use mean signal values and mean noise values. Mucci et al. do not disclose setting the transmit power as a function of the lowest value of the dynamic range and the noise value.

In response to previous arguments, the Examiner cited to Col. 3, lines 50-56 as taking into account "the relevant noise, signal parameters and range of signal values in order to adjust and determine the transmit power automatically." The cited section does disclose automatic setting of the transmit power, but not as a function of the range of signal values. The cited section provides, "once the signal characteristics are known, the range of signal values is known and the transmit power level . . . can be adjusted automatically." The signal characteristics are used to adjust the transmit power level and also make the range of signal values known. Knowing the range is used for setting the grey scale map (col. 8, lines 27-38). The cited disclosure indicates that transmit power is a function of the "signal characteristics," not the range of signal values. As noted in the paragraph above, the noise mean and signal mean are

the signal characteristics used to adjust the transmit power. Mucci discloses transmit power set as function of two means, not the range of signal values.

Setting transmit power as a function of the lowest value is not inherent. The Examiner alleges that the lowest value would "inherently be taken into account since Mucci teaches in col. 8, lines 17-67 that it's system and method eliminates the need for the operator to select a grey scale function in conjunction with other system controls such as transmit power level and receive gain." However, Mucci seeks to separate the signals from noise (col. 5, lines 4-7 and col. 8, lines 34-38). One way is by transmitting with a stronger amplitude so that the mean signal is further from the mean noise or at a set separation (e.g. 3dB)(col. 9, lines 66 - col. 10, lines 13). The peak or highest signal may be used to limit the transmit power (col. 10, lines 3-13). Setting the transmit power for separation of mean signals may or may not separate the lowest signal from the mean noise or even the highest noises (col. 8, lines 22-33 and Fig. 6). The transmit power may change the relative amplitude of received noise and the lowest signal, but is set independently of the lowest signal value. Setting transmit power based on means as taught by Mucci does not inherently set as a function of the lowest signal. As another example, one setting may separate the lowest value from noise by 1dB and another by 3dB. However, altering the separation of the lowest signal value from noise as a result of setting the transmit power with mean signal and noise does not require consideration of the lowest value for setting the transmit power. This result is not even a forgone conclusion, since the noise and lowest values may still overlap despite a higher SNR.

Setting by the noise and signal means is not inherently setting by the lowest value. The lowest value may be close to or far from the mean signal. By setting the transmit power based on the mean signal, no consideration is provided for the lowest value. If the lowest value is far from the mean, the value more likely overlaps noise even with increased SNR (i.e., increased separation of the mean noise and signal by increasing the transmit power). If the lowest value is close to the mean signal, the lowest value is more likely more separated from noise with increased SNR. Setting transmit power based on the mean noise and mean signal may change the separation of the lowest value from noise, but does so without consideration of the separation of the lowest value from noise. The lowest value may or may not be separated from the noise for a given separation of mean noise and signal values, depending on the difference

between the lowest signal value and the mean signal value. Since this difference is not used by Mucci, using the lowest value to set transmit power is not inherent.

The Examiner alleged that elimination of the need to manually set the grey scale contributed in some way to inherently provide for setting the transmit power as a function of the lowest signal value. However, the grey scale setting is a post receive process, not a transmit process like the transmit power. Elimination of the need to set grey scale in conjunction with transmit power does not show inherent setting of transmit power as function of the lowest value. The transmit power is set for transmission to provide a desired signal-to-noise value (Col. 10, lines 1-10). The received values are then processed, including automatic grey scale setting (Col. 8, lines 52-65). Automating both receive and transmit operation is not inherently setting transmit power as a function of the lowest value. If the receive process was performed manually, the transmit power could still be set based on the mean signal and noise values. If the transmit power is set manually, the receive process may still be automated. Elimination of manual grey scale setting does not require a particular transmit power or transmit power set as a function of the lowest value (see Fig. 6 and Col. 11, liens 45-65). Mucci sets the transmit power based on mean values, not a lowest value. The effect on the lowest value separation from noise may result, but may not. The independent grey scale receive processing allows for overlapping as a function of the lowest value. Mucci does not need to track, measure or know the lowest value to set the transmit power.

Independent claim 16 requires determining an excess signal-to-noise ratio with a processor and determining a transmitter power reduction factor as a function of the excess signal-to-noise ratio. Similarly, independent claim 23 requires determining an excess power with a processor and determining a transmitter power reduction factor as a function of the excess power. As discussed above for claim 1, the cited teachings of Mucci et al. merely lead to the use of mean signal and mean noise to set the transmit power. The mean values are used by Mucci et al. to provide a desired signal-to-noise ratio. Contrary to reducing transmit power as a function of an excess signal-to-noise ratio, Mucci et al. seek to separate the noise information from the signal information, such as by increasing the difference between the noise mean and the signal mean (Col. 5, lines 4-7 and Col. 8, lines 17-38). Mucci et al. set the transmit power

level based on the mean signal and mean noise to achieve a desired signal-to-noise ratio (col. 9, line 66-col. 10, line 13). Mucci does not note whether the lowest value overlaps, is separate from or how far separate from the noise signals, just that the means are at the desired separation. As a result, Mucci et al. do not determine an excess signal-to-noise ratio and do not determine a transmitter power reduction factor as a function of the excess signal-to-noise ratio. Mucci seeks to separate the mean signal and noise regardless of the lowest signal value. More or less separation of the lowest signal from noise is not used to set transmit power, and is not inherent.

There is no suggestion to determine any excess signal-to-noise ratio. Mucci et al. suggest setting the transmit power level to provide a desired signal-to-noise ratio. In two examples, Mucci et al. set the transmit power level to be at a particular value to obtain a particular signal-to-noise ratio, one high and one at 3dB (col. 10, lines 1-10). The particular signal-to-noise ratio is set based on the signal mean and noise mean. Mucci et al. determine the transmit power level from these two inputs. There is no suggestion that there may be excess signal-to-noise ratio for reducing the transmit power level from the level determined by Mucci et al. or any other method. Mucci et al. set the transmit power based on the two mean inputs to obtain a target ratio, so there is no suggestion to determine any excess ratio. Even if there is an excess (separation between the lowest signal and noise), Mucci relies on the means to set transmit power, not any excess. Greater separation of the means may provide greater separation of the lowest value from noise, but there is no teaching to determine the excess and identify a parameter to reduce the excess. Mucci teaches separating the means, so teaches away from determining a power reduction factor as a function of an excess.

The receive gain setting may result in different excess signal-to-noise ratio, not setting the transmit power based on the signal and noise means as disclosed by Mucci. In general, the user or an automatic gain algorithm sets the system receive gain, not for SNR uniformity, but for brightness uniformity in range and angle. What is usually considered as optimum system receive gain is the gain that maps the mean of the signal (mainly) from the soft tissue parts of the image to a particular gray level. For example, one of the successful gain optimization algorithms available on a commercial premium ultrasound system determines the soft tissue parts of the image automatically by using a speckle detector, finds the mean of the soft tissue regions thus determined and then maps that to (typically) the 64th

gray level, where 0 corresponds to black and 255 corresponds to white. The gray level of non-soft tissue parts of the image are then dependent on their echogenicity RELATIVE to the mean echogenicity of the nearby soft tissue. As can be seen from this discussion, the optimum system gain has nothing to do with the noise level but with the mean signal level of certain type of objects (assuming SNR for most of the image is greater than 0 dB). At a given a display dynamic range and display depth, the gain set as above determines if there is excess transmit power or not. The noise mean used by Mucci is not for determining an excess.

The dependent claims 4, 8, 9, 12-15 and 17-22 depend from the independent claims 1, 10 and 16 discussed above, so are allowable for the same reasons. The dependent claims are further allowable for additional limitations in the dependent claims not suggested or obvious from Mucci.

As further examples, Mucci does not suggest: preserving brightness based on setting a gain as a function of transmit power and independent of user settings as claimed in claims 4 and 12 (Mucci sets the gain to constrain data to a range suited for the electronics, operator controls and display intensities – col. 10, lines 14-17); calculating a difference between the noise level and the lowest value and reducing the transmit power as a function of the difference as claimed in claims 5 and 13; determining a noise level from a table in response to current imaging parameters as claimed in claims 8 and 15 (Mucci teaches measuring the noise level); performing the claimed acts independently for different regions of an imaging field as claimed in claim 9; displaying the transmitter power reduction factor as claimed in claim 17; initiating determination of the excess and the power reduction factor in response to user input as claimed in claim 19 (Mucci provide for automatic setting once the user configures the system, so would not have suggested initiating in response to user input); recalculating a transmit power level in response to a change in an imaging parameter and initiating determination of excess in response to recalculating as claimed in claim 20 (Mucci automatically calculates the transmit power with the mean signal and mean noise, but do not suggest any triggers for the determination of transmit power); and calculating the excess as a function of the difference between a minimum display signal level and a noise level as claimed in claim 21.

CONCLUSION:

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 943-7350 or Craig Summerfield at (312) 321-4726.

Respectfully submitted,

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